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Conidial fungi from the semi-arid Caatinga biome of Brazil. New species and records for *Thozetella*

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Abstract — As a result of an investigation of microfungi in northeastern Brazil, the hyphomycete *Thozetella submersa* sp. nov. is described from submerged wood. Its diagnostic features are the smooth, elliptic-fusiform, obclavate to rarely obovoid to obclavate, slightly curved, sometimes corniculate at the ends, microawns. *T. boonjiensis* and *T. gigantea* are recorded for the first time for the American continent. A key to all described species is included. A synopsis of drawings of microawns (most based on original papers) is provided for all *Thozetella* species.

Key words — anamorphic fungi, diversity, taxonomy

Introduction

Thozetella Kuntze presently includes fifteen species (Castañeda et al. 2002, Paulus et al. 2004, Allegrucci et al. 2004, Jeewon et al. 2009) found in temperate and warm regions (Nag Raj 1976, Grandi & Gusmão 2002, Piontelli & Giusiano 2004, Barbosa et al. 2007). Among the variety of sterile structures known for the hyphomycetes, the presence of microawns is unique for the genus (Sutton & Cole 1983).

Recent phylogenetic and morphological research of five species of *Thozetella* from Australia by Paulus (et al. 2004) confirms that *Thozetella* species are anamorphs of the ascomycete *Chaetosphaeria* Tul. & C. Tul. Their key to 14 described species of *Thozetella* (Paulus et al. 2004) did not include *T. buxifolia* Allegr. et al. (Allegrucci et al. 2004). In their synoptic table of *Thozetella* species, Paulus et al. (2004), who apparently did not examine the holotype, cited a median to submedian septum for microawns in *T. canadensis* Nag Raj although this character was not mentioned in the protologue (Nag Raj 1976). In the present work, almost all characters are based on original species descriptions.

Recently, *T. pinicola* S.Y.Q. Yeung et al. was described from leaf litter of *Pinus elliottii* Engelm. in Hong Kong. This new taxon was based on morphology and DNA sequence analyses (Jeewon et al. 2009).

Paulus et al. (2004), Allegrucci et al. (2004), and Jeewon et al. (2009) retain *T. ciliata* (R.F. Castañeda et al.) Hol.-Jech. & Mercado within *Thozetella*. However, we refer this specimen to *Venustosynnema ciliatum* (R.F. Castañeda et al.) R.F. Castañeda & W.B. Kendr. In their discussion of *V. ciliatum*, Castañeda-Ruiz et al. (2002) note that the absence microawns and presence of dark brown setae are characters that exclude the species from *Thozetella*.

Thozetella species have been reported from leaf litter (Grandi 1999, Parungao et al. 2002, Castañeda-Ruiz et al. 2003, Allegrucci et al. 2004), decaying floral parts (Agnihothrudu 1958), soil (Agnihothrudu 1962), roots (Waipara et al. 1996), stalks (Nag Raj 1976), and bark (Morris 1956). This constitutes the third report of the genus from freshwater habitats following those of *T. havanensis* R.F. Castañeda (from submerged leaf litter) and *T. nivea* (Berk.) Kuntze (from wood) (Sivichai et al. 2002, Delgado-Rodrigues & Mena-Portales 2004).

From Brazil, five *Thozetella* species have been found: *T. cristata* Piroz. & Hodges, *T. cubensis* R.F. Castañeda & G.R.W. Arnold, *T. havanensis* (Barbosa et al. 2007, Silva & Grandi 2008), *T. queenslandica* B.C. Paulus, Gadek & K.D. Hyde (Cruz & Gusmão 2009), and *T. tocklaiensis* (Agnihothr.) Piroz. & Hodges (Maia et al. 2002).

Materials & methods

Study site. Collecting trips were made to the hygrophilous forests called "Serra da Jibóia" in the semi-arid region in the northeastern of Brazil. This area has been described previously (Barbosa et al. 2007, Marques et al. 2007)

Collection techniques. Submerged leaves and wood debris were collected from a lotic habitat in an unnamed stream in the "Serra da Jibóia". Samples were placed in plastic bags and returned to the laboratory. The plant material was then incubated at 25°C in Petri dish moist chambers and stored in 50 L plastic boxes with 200 ml sterile water plus 2 ml glycerol. Samples were examined over four weeks for the presence of conidiomata.

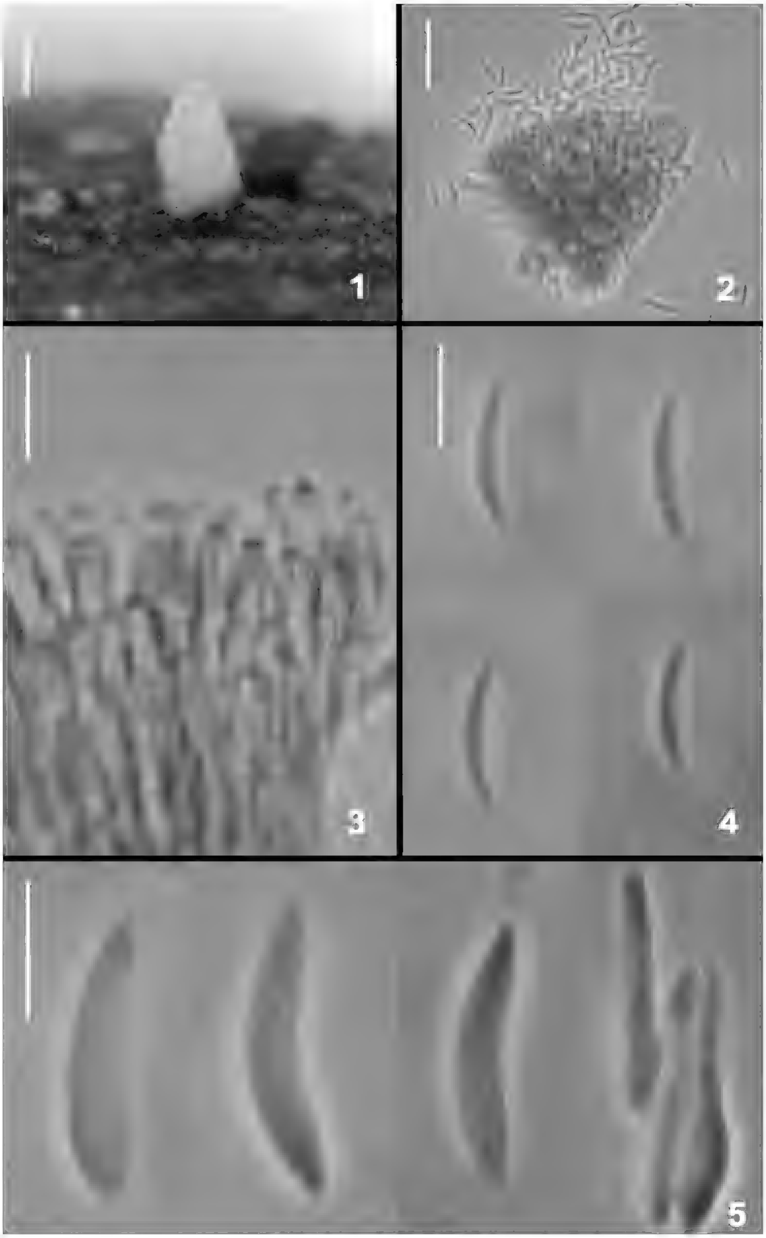
Specimen examination. Conidiomata were located with a dissecting microscope and removed to a glass slide where they were crushed and mounted in polyvinyl alcohol-glycerol (8.0 g in 100 ml of water, plus 5 ml of glycerol). Measurements were made of fixed material. Permanent slides were deposited in HUEFS.

Taxonomy

Thozetella submersa F.R. Barbosa & Gusmão, **sp. nov.** Fig. 1–5

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Ab omnibus speciebus Thozetellae differt microaristis unicellularibus ellipsoidi-fusiformibus, raro obovatis vel obclavatis, minute curvis, laevibus, utrinque interdum solo corniculatis praeditis, hyalinis, 16 25µm longis, 3 4 µm latis at basi, 2 3 µm latis at apicem.



Figs. 1–5. *Thozetella submersa* (from the holotype). 1. Conidioma on the natural substrate. 2. General aspect of a conidioma without the conidial mass. 3. Conidiogenous cells. 4. Conidia. 5. Microawns. (Scale bars: 1 = 100 μm; 2 = 50 μm; 3–5 = 10 μm).

HOLOTYPUS: Brazil. Bahia: Santa Terezinha, Serra da Jibóia, on submerged wood from a stream, 25.III.2009, coll. FR Barbosa, HUEFS 141560.

ETYMOLOGY: the Latin *submersa* refers to the submerged habitat.

CONIDIOMATA sporodochial, superficial, sessile, 200–250 × 105–150 µm, moist and white mass. CONIDIOPHORES macronematous, compact at the base but more or less free distally, septate, smooth, cylindrical, brown, paling toward the apex, ≤ 3 µm diam. CONIDIOGENOUS CELLS monophialidic, integrated, determinate, terminal, cylindrical, light brown, 7.5–10 × 2.5–3 µm, lacking an apical collarette. MICROAWNS not visible in mass on the natural substratum, smooth, elliptic-fusiform, rarely obovoid to obclavate, slightly curved, sometimes corniculate at the ends, hyaline, 16–25 µm long, 3–4 µm wide at the base, 2–3 µm wide at the apex. CONIDIA aseptate, smooth-walled, finely guttulate or eguttulate, lunate, hyaline, 14–15 × 2–2.5 µm, provided with a single filiform setula at each end, 5–7 µm long.

NOTES: *Thozetella submersa* can be easily diagnosed by the morphology and smaller size of the microawns. A synopsis of microawns (FIG. 6) and a key to the published species are included.

Thozetella boonjiensis B.C. Paulus, Gadek & K.D. Hyde, Mycologia 96: 1076. 2004.

CONIDIOMATA sporodochial. MICROAWNS L-shaped, 0-septate, hyaline, 54–63 × 3–4.5 µm, apex acerose. CONIDIA 10.5–14.3 × 1.5–3 µm. SETULAE 5.3–7.5 µm long.

EXAMINED MATERIAL: BRAZIL. BAHIA: Santa Terezinha, Serra da Jibóia, on decaying wood, 01.VIII.2008, coll. Fiuza P.O. (HUEFS148834).

NOTES: *Thozetella boonjiensis* resembles *T. acerosa* B.C. Paulus et al., *T. gigantea,* and *T. tocklaiensis* in the L-shaped microawns, which are, however, septate in *T. acerosa.* Both microawns and conidia are larger in *T. gigantea* and smaller in *T. tocklaiensis* (Paulus et al. 2004, Piontelli & Giusiano 2004). *Thozetella boonjiensis* was previously known only from the type locality (Australia) (Paulus et al. 2004).

Thozetella gigantea B.C. Paulus, Gadek & K.D. Hyde, Mycologia 96: 1080. 2004.

CONIDIOMATA sporodochial; MICROAWNS L-shaped, 0-septate, hyaline, 81–141 µm long, 4.5–6 µm wide at base. CONIDIA 13–15 × 1.5–2 µm. SETULAE 7.5–9 µm long.

EXAMINED MATERIAL: BRAZIL. BAHIA: Santa Terezinha, Serra da Jibóia, on decaying leaves, 02.VIII.2007, coll. Silva, S.S. (HUEFS141569).

NOTES: *T. gigantea* is characterized by its microawns, which are the largest for the genus (Paulus et al. 2004). This species has been registered only from type locality (Australia) (Paulus et al. 2004).

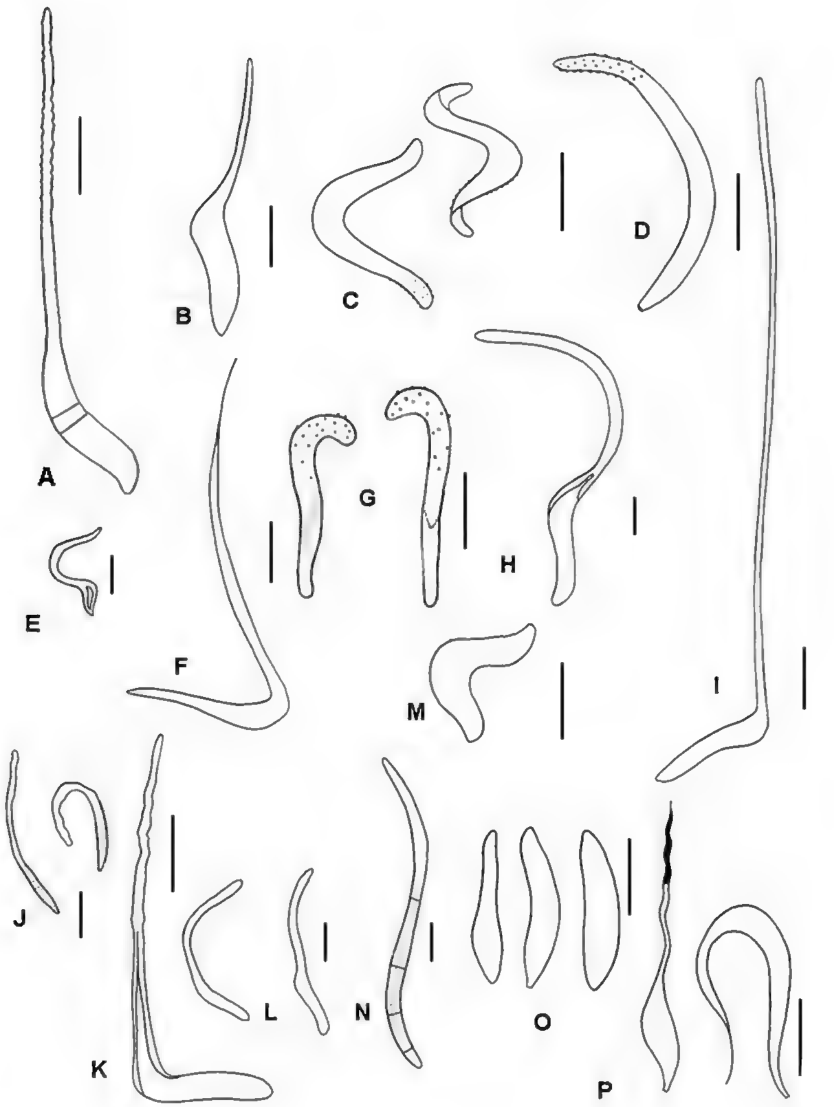


Fig. 6. Microawns of *Thozetella* species. A. *T. acerosa*; B. *T. boonjiensis*; C. *T. buxifolia*; D. *T. canadensis*; E. *T. cristata*; F. *T. cubensis*; G. *T. effusa*; H. *T. falcata*; I. *T. gigantea*; J. *T. havanensis*; K. *T. nivea*; L. *T. pinicola*; M. *T. queenslandica*; N. *T. radicata*; O. *T. submersa*; P. *T. tocklaiensis*. (Scale bars: A P 10 µm).

Key to *Thozetella* species

1.	Microawns predominantly L-shaped	2
1a.	Microawns not L-shaped or variously shaped	5
2.	Microawns 0–2 septate	*T. acerosa*
2a.	Microawns aseptate	3
3.	Microawns 75 µm or longer	*T. gigantea*
3a.	Microawns shorter than 75 µm	4
4.	Microawn apex undulating to geniculate	*T. nivea*
4a.	Microawn apex straight to slightly undulating	*T. boonjiensis*
5.	Microawns predominantly sickle-shaped, uncinate, hamate or otherwise strongly curved	6
5a.	Microawns predominantly straight, sigmoid or of other shape	11
6.	Conidiomata predominantly synnematous	7
6a.	Conidiomata predominantly sporodochial	10
7.	Synnemata proliferating conidiophores form ridges	8
7a.	Synnemata non-proliferating	9
8.	Microawns 40–60 × 2.5–3 µm, smooth	*T. cristata*
8a.	Microawns 25–30 × 3–3.5 µm, verrucose	*T. buxifolia*
9.	Microawns 40–95 × 2.5–5 µm, setulae 5–8 µm long	*T. falcata*
9a.	Microawns 30–60 × 3–4.5 µm, setulae 5 µm long	*T. radicata*
10.	Microawns 21–34 × 2–4 µm, smooth or apically verrucose	*T. queenslandica*
10a.	Microawns 40–100 µm long, 2.5–4 µm wide at base, 0.5–1 µm wide at apex, smooth	*T. cubensis*
11.	Conidiomata effuse	*T. effusa*
11a.	Conidiomata otherwise	12
12.	Conidiomata sporodochial	13
12a.	Conidiomata synnematous	15
13.	Microawns verrucose	*T. canadensis*
13a.	Microawns smooth	14
14.	Microawns elliptic-fusiform, 16–25 × 3–4 wide at the base, 2 3 µm wide at the apex	*T. submersa*
14a.	Microawns straight or slightly undulating with the apical end acerose, 25–55 × 2.5–5 µm	*T. pinicola*
15.	Microawns variously shaped, bulbous base, acerose apex, straight, undulate, uncinate or bent,18–38 × 1.5–4 µm	*T. tocklaiensis*
15a.	Microawns with ± uniform width, sigmoid, allantoid, uncinate, 22.4–35 × 1.5–3.2 µm	*T. havanensis*

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